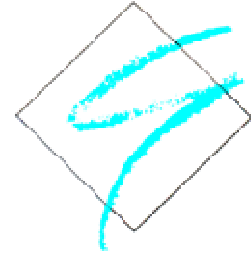


GINOS ENGINEERING PTY LTD

Consulting Engineers
ABN 22 621 716 121

452 Pulteney Street
ADELAIDE SA 5000
Phone (08) 8212 4900
email@ginosengineers.com.au
www.ginosengineers.com.au



STRUCTURAL CALCULATIONS

CLIENT: TRUE STEEL FRAMES

JOB ADDRESS: Dw. 3, 19-21 ALBION TERRACE, CAMPBELLTOWN

JOB NUMBER: 42559

DATE: FEB'21

ENGINEER: DJS

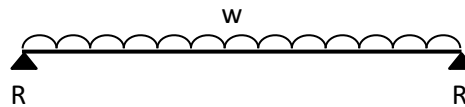
Notes:

1. Dead and live loads and load combinations to AS1170.0 and AS1170.1
2. Wind Loads to AS/NZS1170.2 & AS4055
3. Steelwork to AS4100



BEAM B

L = 3.8 m



Loads

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.10		
Wall (HB)	3.7 m	1.00 kPa	3.70		
Roof (S)	0.6 m	0.40 kPa	0.24	0.25 kPa	0.15
Floor	0.3 m	1.00 kPa	0.30	1.50 kPa	0.45

Load combinations

w = DL =	4.3 kN/m	-->	R =	8.2 kN
w = LL =	0.6 kN/m	-->	R =	1.1 kN
w* = 1.2DL + 1.5LL =	6.1 kN/m	-->	R* =	11.6 kN

TRY: TSF4510 (FLR)

Check Strength

M* = 11.02 kNm
M_{oa} =
α_s =
α_m =
φM_{sx} = 22.25 kNm :: OK

$M = 0.125wL^2$
AS4100 - C5.6.1
AS4100 - C5.6.1
AS4100 - T5.6.1

Check deflection

I_x = 10.7771 x 10⁶ mm⁴
Δ_{dl} = 5.5 mm (~L / 695)
Δ_{total} = 6.2 mm (~L / 611)

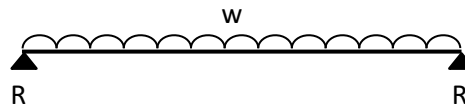
$$\Delta = \frac{5wL^4}{384EI}$$

USE: TSF4510



BEAM B1

L = 4.2 m



Loads

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.40		
Wall (HB)	0.0 m	1.00 kPa	0.00		
Roof (S)	0.0 m	0.40 kPa	0.00	0.25 kPa	0.00
Floor	3.2 m	1.00 kPa	3.20	1.50 kPa	4.80

Load combinations

w = DL =	3.6 kN/m	-->	R =	7.5 kN
w = LL =	4.8 kN/m	-->	R =	10.0 kN
w* = 1.2DL + 1.5LL =	11.5 kN/m	-->	R* =	24.0 kN

TRY: 2/TSF4510 (2TC & 2BC) (FLR)

Check Strength

M* = 24.92 kNm
M_{oa} =
 α_s =
 α_m =
 ϕM_{sx} = 88.98 kNm :: OK

$M = 0.125wL^2$
AS4100 - C5.6.1
AS4100 - C5.6.1
AS4100 - T5.6.1

Check deflection

I_x = 43.1083 x 10⁶ mm⁴
 Δ_{dl} = 1.6 mm (~L / 2555)
 Δ_{total} = 3.8 mm (~L / 1095)

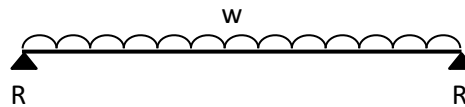
$$\Delta = \frac{5wL^4}{384EI}$$

USE: 2/TSF4510 (2TC & 2BC)



BEAM B2

L = 4.1 m



Loads

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.40		
Wall (HB)	4.0 m	1.00 kPa	4.00		
Roof (S)	3.5 m	0.40 kPa	1.40	0.25 kPa	0.88
Floor	0.5 m	0.70 kPa	0.35	1.50 kPa	0.75

Load combinations

w = DL =	6.2 kN/m	-->	R =	12.6 kN
w = LL =	1.6 kN/m	-->	R =	3.3 kN
w* = 1.2DL + 1.5LL =	9.8 kN/m	-->	R* =	20.1 kN

TRY: 2/TSF4510 (2TC & 2BC) (FLR)

Check Strength

M* = 20.63 kNm
M_{oa} =
α_s =
α_m =
φM_{sx} = 88.98 kNm :: OK

$M = 0.125wL^2$
AS4100 - C5.6.1
AS4100 - C5.6.1
AS4100 - T5.6.1

Check deflection

I_x = 43.1083 x 10⁶ mm⁴
Δ_{dl} = 2.6 mm (~L / 1562)
Δ_{total} = 3.3 mm (~L / 1236)

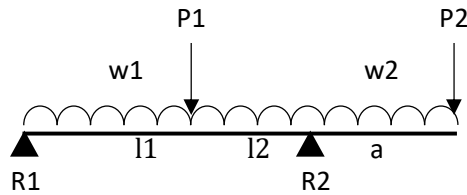
$$\Delta = \frac{5wL^4}{384EI}$$

USE: 2/TSF4510 (2TC & 2BC)



BEAM B3

l1 = 2.5 m
l2 = 3.9 m
a = 0.4 m
L = 6.8 m



Loads

UDL - w1			DL (kN/m)	LL (kN/m)
S/W	-	-	0.55	
Wall (HB)	3.0 m	1.00 kPa	3.00	
Roof (S)	1.2 m	0.40 kPa	0.48	0.25 kPa
Floor	0.0 m	1.00 kPa	0.00	1.50 kPa

UDL - w2			DL (kN/m)	LL (kN/m)
Wall (HB)	2.7 m	1.00 kPa	2.70	
Roof (S)	1.2 m	0.40 kPa	0.48	0.25 kPa
Floor	0.0 m	1.00 kPa	0.00	1.50 kPa

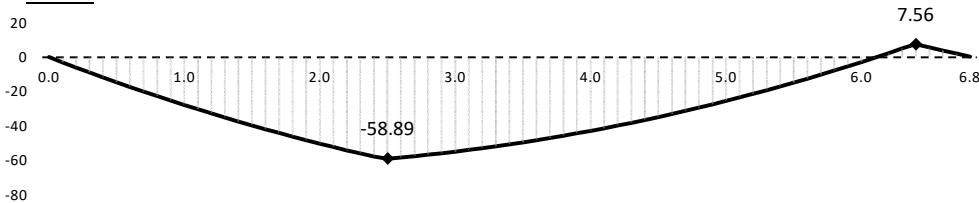
Load Combinations

	w1 (kN/m)	w2 (kN/m)	P1 (kN)	P2 (kN)	R1 (kN)	R2 (kN)
Working LC1	DL 4.03	DL+LL 4.03	7.5	13.7	--> 16.5	32.1
Working LC2	DL+LL 4.33	DL 3.73	17.5	11.9	--> 23.7	34.8
Ultimate	1.2DL+1.5LL 5.29	1.2DL+1.5LL 4.93	24.0	17.0	--> 30.4	46.3

TRY: 380PFC Le = 3.9 m

Check Strength

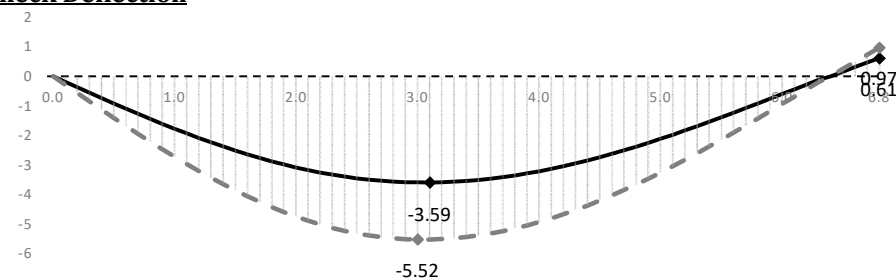
BMD



M* = 58.89 kNm
-M* = -7.56 kNm
Moa = 218.12 kNm
 α_s = 0.54
 α_m = 1.00
 ϕM_{bx} = 128.78 kNm :: OK

AS4100 - C5.6.1
AS4100 - C5.6.1
AS4100 - T5.6.1

Check Deflection



LC1
(~l / 1777)
(~a / 913)

LC2
(~l / 1156)
(~a / 575)

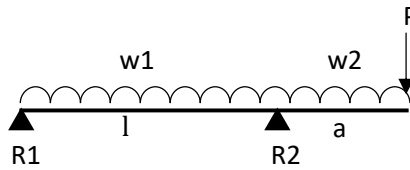
USE: 380PFC

— Deflection LC1
- - - Deflection LC2



BEAM B4 CANTI.

$l =$ 2.8 m
 $a =$ 0.6 m
 $L =$ 3.4 m



Loads

<u>UDL - w1</u>			<u>DL (kN/m)</u>	<u>LL (kN/m)</u>
S/W	-	-	0.40	
Wall (HB)	3.0 m	1.00 kPa	3.00	
Roof (S)	2.6 m	0.40 kPa	1.04	0.25 kPa
Floor	2.1 m	0.70 kPa	1.44	1.50 kPa

<u>UDL - w2</u>			<u>DL (kN/m)</u>	<u>LL (kN/m)</u>
Wall (HB)	3.0 m	1.00 kPa	3.00	
Roof (S)	2.0 m	0.40 kPa	0.80	0.25 kPa
Floor	2.1 m	0.70 kPa	1.44	1.50 kPa

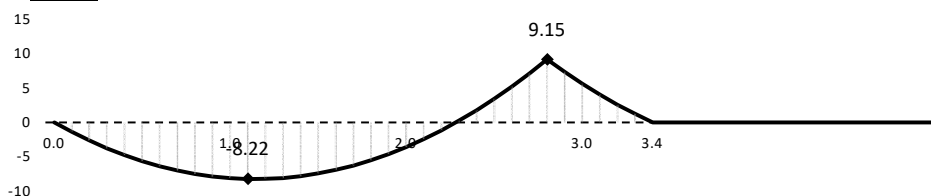
Load Combinations

	<u>w1 (kN/m)</u>		<u>w2 (kN/m)</u>		<u>P (kN)</u>		<u>R1 (kN)</u>	<u>R2 (kN)</u>
Working	DL	5.88	DL+LL	9.21	9.4	-->	5.6	25.7
Ultimate	1.2DL+1.5LL	12.64	1.2DL+1.5LL	12.12	11.6	-->	14.4	39.8

TRY: 2/TSF4510 (2TC & 2BC) (FLR)

Check Strength

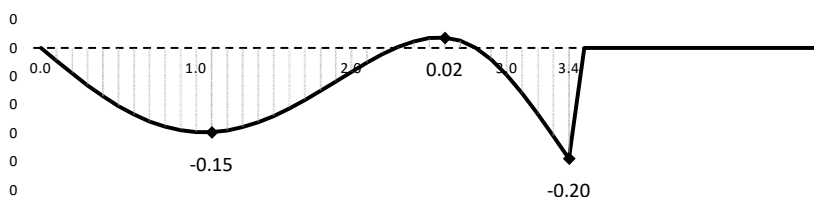
BMD



$M^* =$ 8.22 kNm
 $-M^* =$ -9.15 kNm
 $M_{oa} =$
 $\alpha_s =$
 $\alpha_m =$
 $\phi_{Msx} =$ 88.98 kNm :: OK

AS4100 - C5.6.1
AS4100 - C5.6.1
AS4100 - T5.6.1

Check Deflection



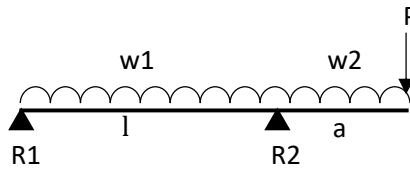
(~l / 18667)
(~a / 3000)

USE: 2/TSF4510 (2TC & 2BC)



BEAM CB

l = 0.6 m
a = 1.5 m
L = 2.1 m



Loads

UDL - w1			DL (kN/m)		LL (kN/m)
S/W	-	-	0.10		
Wall (Br.Vr)	0.0 m	2.40 kPa	0.00		
Roof (T)	0.0 m	1.00 kPa	0.00	0.25 kPa	0.00
Floor	0.0 m	1.00 kPa	0.00	1.50 kPa	0.00

UDL - w2			DL (kN/m)		LL (kN/m)
Wall (LW)	0.4 m	0.40 kPa	0.16		
Roof (S)	0.9 m	0.40 kPa	0.35	0.25 kPa	0.22
Floor	0.0 m	1.00 kPa	0.00	1.50 kPa	0.00

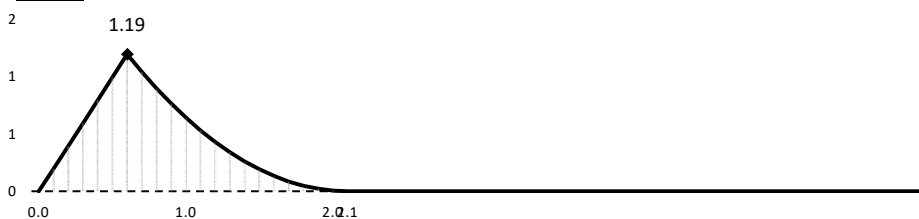
Load Combinations

	w1 (kN/m)		w2 (kN/m)		P (kN)		R1 (kN)	R2 (kN)
Working	DL	0.10	DL	0.61	1.4	-->	-4.6	7.0
Ultimate	1.2DL+1.5LL	0.12	1.2DL+1.5LL	1.06	0.0	-->	-2.0	3.6

TRY: 150x50x3.0 RHS Le = 2.0 m

Check Strength

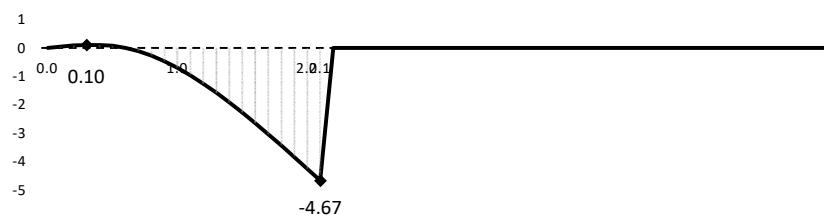
BMD



M* = 0.00 kNm
-M* = -1.19 kNm
Moa = 176.49 kNm
 α_s = 0.98
 α_m = 1.00
 ϕM_{bx} = 15.87 kNm :: OK

AS4100 - C5.6.1
AS4100 - C5.6.1
AS4100 - T5.6.1

Check Deflection



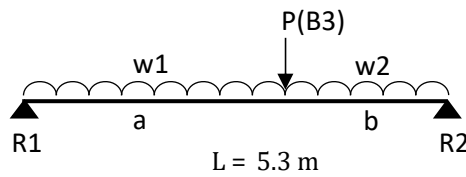
(~l / 6000)
(~a / 321)

USE: 150x50x3.0 RHS



BEAM L1

a = 1.3 m
b = 4.0 m



Loads

UDL - w1			DL (kN/m)		LL (kN/m)
S/W	-	-	0.55		
Wall (HB)	1.5 m	1.00 kPa	1.50		
Roof (S)	1.2 m	0.40 kPa	0.48	0.25 kPa	0.30
Floor	0.0 m	0.70 kPa	0.00	1.50 kPa	0.00

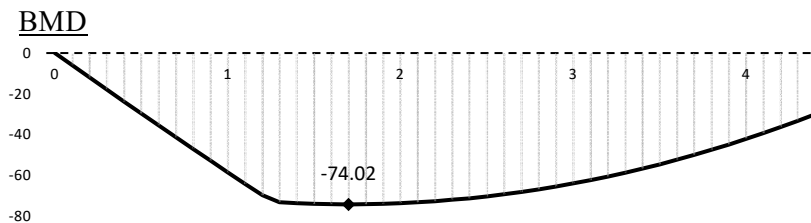
UDL - w2			DL (kN/m)		LL (kN/m)
Wall (HB)	4.0 m	1.00 kPa	4.00		
Roof (S)	0.0 m	0.40 kPa	0.00	0.25 kPa	0.00
Floor	2.2 m	0.70 kPa	1.51	1.50 kPa	3.23

Load combinations

	w1	w2	P		R1	R2
(W) DL	2.53	6.06	30.8	-->	35.5	22.7
(W) LL	0.30	3.23	8.5	-->	11.7	10.1
(U) 1.2DL+1.5LL	3.49	12.10	49.7	-->	60.1	42.3

TRY: 380PFC Le = 4.0 m

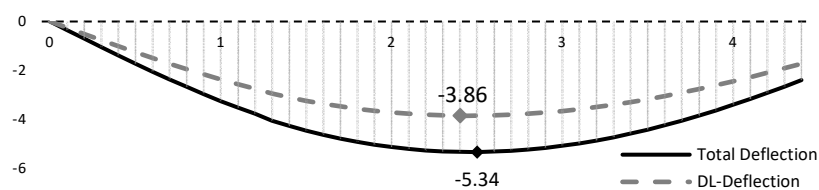
Check Strength



M* = 74.02 kNm
Moa = 212.32 kNm
 α_s = 0.53
 α_m = 1.00
 ϕM_{bx} = 126.79 kNm :: OK

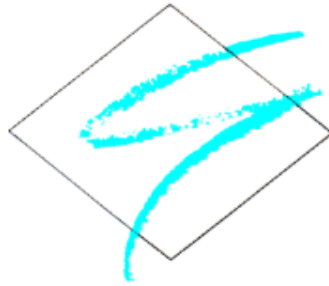
AS4100 - C5.6.1
AS4100 - C5.6.1
AS4100 - T5.6.1

Check Deflection



(~L / 983)
(~L / 1360)

USE: 380PFC



Job Number: 42559
 Design: DJS
 Date: Feb-21
 Page:

WIND BEAM (WB)

Contributing Width (c/w) = 3 m

Beam Span (L) = 5.3 m

Le = 4.3 m

Wind Speed (Ws) = 32 m/s

q = $[(Ws^2) \times 0.6] / 1000$
 = 0.61 kPa

F_R = $(0.7 + 0.5) \times q \times c/w$
 = 1.29 kN/m

$M_{(working)}$ = $(F_R \times L^2) / 8$
 = 2.98 kNm

$I_{req} = 1666976$

= $1.7 \times 10^6 \text{ mm}^4$

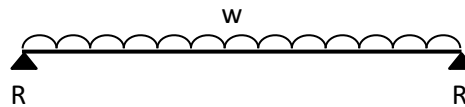
Deflection Limit = $\frac{L}{250}$

USE: 89x89x5.0 SHS (C350)



BEAM PF1

L = 2.8 m



Loads

			<u>DL (kN/m)</u>		<u>LL (kN/m)</u>
S/W	-	-	0.25		
Wall (HB)	0.3 m	1.00 kPa	0.30		
Roof (S)	0.0 m	0.40 kPa	0.00	0.25 kPa	0.00
Floor	0.6 m	1.00 kPa	0.60	1.50 kPa	0.90

Load combinations

w = DL =	1.2 kN/m	-->	R =	1.6 kN
w = LL =	0.9 kN/m	-->	R =	1.3 kN
w* = 1.2DL + 1.5LL =	2.7 kN/m	-->	R* =	3.8 kN

TRY: 230PFC Le = 2.8 m

Check Strength

M* =	2.68 kNm
Moa =	74.18 kNm
α_s =	0.57
α_m =	1.00
ϕM_{bx} =	41.90 kNm :: OK

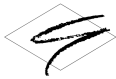
$M = 0.125wL^2$
AS4100 - C5.6.1
AS4100 - C5.6.1
AS4100 - T5.6.1

Check deflection

I _x =	26.8 x 10 ⁶ mm ⁴
Δ_{dl} =	0.2 mm (~L / 16306)
Δ_{total} =	0.3 mm (~L / 9147)

$$\Delta = \frac{5wL^4}{384EI}$$

USE: 230PFC

**PORTAL FRAME PF1****1. Column C1**

Max height = 3.0 m
 Nominate WL* = 10.0 kN
 $\Rightarrow M^*$ (wind) = 15.0 kNm

Try 230PFC

Eccentricity = 0.215 m
 N^* (DL) = 5.0 kN
 $\Rightarrow M^*$ (e) = 1.1 kN/m

M^* (total) = 16.1 kN/m

Section Capacity

$$\frac{M^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.23$$

Check member capacity

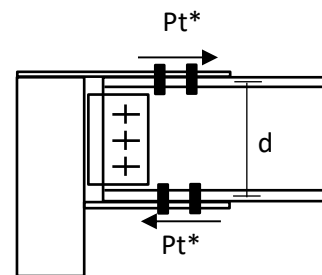
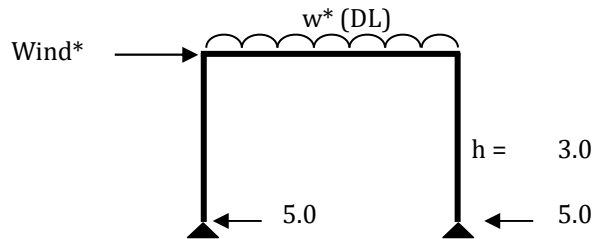
$$\frac{M^*}{\phi M_s} + \frac{N^*}{\phi N_c} = 0.24 \text{ (For } L_e = 3.0\text{m)}$$

USE: 230PFC

2. Connection

Design top & bottom bolts for wind

d = 0.23 m
 $P_t^* = M^* / d = 69.89 \text{ kN}$



\Rightarrow USE 2M20 8.8/S

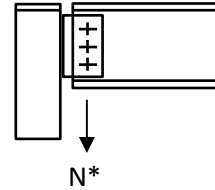


COLUMN C2

Max height = 3.0 m

Loads

$$\begin{aligned} N^* &= 60.00 \text{ kN} \\ N_e^* &= 60.00 \text{ kN} \\ M_e^* &= 8.67 \text{ kNm} \quad (e = 0.145 \text{ m}) \end{aligned}$$



TRY: 89x89x5.0 SHS

Properties

$$\begin{aligned} \phi N_s &= 502.0 \text{ kN} \quad (\text{for } l_e = 3.0 \text{ m}) \\ \phi N_c &= 283.0 \text{ kN} \\ \phi M_{sx} &= 15.5 \text{ kNm} \\ \phi M_{bx} &= 15.5 \text{ kNm} \end{aligned}$$

Check section capacity

$$\frac{M_e^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.68 < 1.0, \text{ therefore OK}$$

Check member capacity

$$\frac{M_e^*}{\phi M_b} + \frac{N^*}{\phi N_c} = 0.77 < 1.0, \text{ therefore OK}$$

USE: 89x89x5.0 SHS

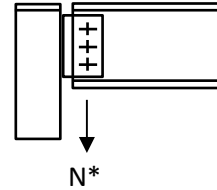


COLUMN C3

Max height = 3.0 m

Loads

$$\begin{aligned} N^* &= 42.00 \text{ kN} \\ N_e^* &= 42.00 \text{ kN} \\ M_e^* &= 6.07 \text{ kNm} \quad (e = 0.145 \text{ m}) \end{aligned}$$



TRY: 89x89x3.5 SHS

Properties

$$\begin{aligned} \phi N_s &= 364.0 \text{ kN} \quad (\text{for } l_e = 3.0 \text{ m}) \\ \phi N_c &= 211.0 \text{ kN} \\ \phi M_{sx} &= 11.5 \text{ kNm} \\ \phi M_{bx} &= 11.5 \text{ kNm} \end{aligned}$$

Check section capacity

$$\frac{M_e^*}{\phi M_s} + \frac{N^*}{\phi N_s} = 0.64 < 1.0, \text{ therefore OK}$$

Check member capacity

$$\frac{M_e^*}{\phi M_b} + \frac{N^*}{\phi N_c} = 0.73 < 1.0, \text{ therefore OK}$$

USE: 89x89x3.5 SHS